CLAIMS

1. An expansion tank device comprising a tank installation base having a cooling liquid channel and an expansion tank provided on an upper surface of the installation base, the tank installation base having a communication hole for holding space above the upper surface thereof in communication with the cooling liquid channel, the expansion tank having a tank main body including an upwardly bulging portion having an opening at a lower end thereof, and a bottom plate joined to a lower end of the tank main body for closing the lower-end opening of the bulging portion and joined to the upper surface of the tank installation base, the bottom plate of the expansion tank being provided at a portion thereof corresponding to the communication hole with a through hole communicating with the communication hole of the tank installation base, the bottom plate being provided with a baffle plate formed along the entire circumference of an inner peripheral edge thereof defining the through hole and slanting upwardly toward a central portion of the through hole.

2. An expansion tank device according to claim 1 wherein the tank installation base is made by joining upper and lower two base forming sheets as superposed on each other, and the cooling liquid channel is formed between the upper and lower two base forming sheets by downwardly bulging the lower base forming sheet, the communication hole being formed in the upper base forming sheet.

3. An expansion tank device according to claim 2 wherein the upper and lower two base forming sheets are each made of

a metal, and the upper and lower two base forming sheets are joined by brazing.

4. An expansion tank device according to claim 2 wherein the upper and lower two base forming sheets are each made of aluminum, and are brazed with a brazing material layer formed on at least one of a lower surface of the upper base forming sheet and an upper surface of the lower base forming sheet.

5. An expansion tank device according to claim 4 wherein the bottom plate is made of aluminum, and the bottom plate is brazed to the upper base forming sheet utilizing a brazing material layer formed on at least one of a lower surface of the bottom plate and an upper surface of the upper base forming sheet.

6. An expansion tank device according to claim 1 wherein the bulging portion of the tank main body has a flat top wall, and the top wall has a downwardly projecting portion opposed to an opening defined by an upper end of the baffle plate.

7. An expansion tank device according to claim 1 wherein the tank main body and the bottom plate are each made of a metal, and the bulging portion of the tank main body is provided along an outer periphery thereof with an outward flange brazed to the bottom plate.

8. An expansion tank device according to claim 7 wherein the tank main body and the bottom plate are each made of aluminum, and the outward flange of the tank main body is brazed to the bottom plate utilizing a brazing material layer formed on at least one of a lower surface of the tank main body and an upper surface of the bottom plate.

9. A process for fabricating an expansion tank device according to claim 1, the process including the steps of: preparing a lower base forming metal sheet having a downwardly bulging cooling liquid channel and an upper base forming metal sheet having a communication hole formed therethrough, preparing a tank main body of metal including an upwardly bulging portion having an opening at a lower end thereof and a bottom plate of metal for closing the lower-end opening of the bulging portion of the tank main body, forming a through hole in the bottom plate and forming a baffle plate on the bottom plate along the entire circumference of an inner peripheral edge thereof defining the through hole, the baffle plate slanting upwardly toward a central portion of the through hole, superposing the upper base forming sheet on the lower base forming sheet with the communication hole opposed to the cooling liquid channel, placing the bottom plate on the upper base forming sheet with the communication hole included in the through hole and placing the tank main body on the bottom plate with the baffle plate positioned inside the upwardly bulging portion, and brazing the upper and lower base forming sheets to each other, the base plate to the upper base forming sheet and the tank main body to the bottom plate at the same time.

10. A process for fabricating an expansion tank device according to claim 9 which comprises making the upper and lower base forming sheets, the bottom plate and the tank main body from aluminum, forming a blazing material layer on at least one of a lower surface of the upper base forming sheet and an upper surface of the lower base forming sheet, forming a

blazing material layer on at least one of a lower surface of the tank main body and an upper surface of the bottom plate, forming a blazing material layer on at least one of a lower surface of the bottom plate and an upper surface of the upper base forming sheet, and brazing the upper and lower base forming sheets to each other, the base plate to the upper base forming sheet and the tank main body to the bottom plate using these brazing material layers.

11. A liquid cooling radiator comprising a cooling liquid circulating channel connected to opposite-end openings of the cooling liquid channel in the tank installation base of the expansion tank device according to claim 1, a heat receiving unit provided at an intermediate portion of the circulating channel, and a pump for circulating a cooling liquid through the cooling liquid channel of the tank installation base and the circulating channel.

12. A liquid cooling radiator according to claim 11 wherein the cooling liquid is enclosed in the cooling liquid channel and the circulating channel in an amount permitting the cooling liquid to fill the cooling liquid channel and the circulating channel, with the liquid level inside the bulging portion of the expansion tank positioned above an opening defined by an upper end of the baffle plate on the tank bottom plate, when the expansion tank device is in a vertical position, the amount of the cooling liquid further permitting the cooling liquid to fill the cooling liquid channel and the circulating channel, with the liquid level inside the bulging portion of the expansion tank positioned above the opening defined by the baffle plate

upper end, when the expansion tank device is turned upside down.

13. A liquid cooling radiator according to claim 11 wherein the heat receiving unit comprises a heat receiving unit main body made from two highly heat-conductive sheets joined as superposed on each other and provided with a cooling liquid channel having opposite-end openings between the two heat-conductive sheets, and a heat transfer member made from a highly heat-conductive material and provided inside the cooling liquid channel of the unit main body, the unit main body having an outer surface providing a heat receiving portion thermally in contact with a heat generating body.

14. A liquid cooling radiator according to claim 13 wherein the heat transfer member comprises a flat tube having a plurality of borelike passageways formed in parallel and extending longitudinally of the cooling liquid channel of the unit main body.

15. A liquid cooling radiator according to claim 14 wherein the two heat-conductive sheets and the flat tube are each made of aluminum, and the two heat-conductive sheets are brazed to each other, the flat tube being brazed to the two heat-conductive sheets.

16. A liquid cooling radiator according to claim 15 wherein the flat tube is brazed except at opposite end portions thereof to the two heat-conductive sheets.

17. A liquid cooling radiator according to claim 16 wherein the two heat-conductive sheets and the flat tube are each made of a bare aluminum material, and the flat tube is

brazed to the two heat-conductive sheets with a sheet of brazing material.

18. A liquid cooling radiator according to claim 16 wherein one of the two heat-conductive sheets comprises an aluminum brazing sheet having a brazing material layer on an inner surface thereof, and the other heat-conductive sheet and the flat tube each comprise a bare aluminum material, said one heat-conductive sheet having two portions including respective opposite ends of the flat tube and bulged outward over a length not smaller than the entire width of the flat tube, each of said opposite ends of the flat tube being positioned at a widthwise intermediate part of the corresponding bulged portion of said one heat-conductive sheet, the flat tube being brazed to said one heat-conductive sheet with the brazing material layer of the aluminum brazing sheet, the flat tube being brazed to said other heat-conductive sheet with a sheet of brazing material.

19. A liquid cooling radiator according to claim 16 wherein each of the two heat-conductive sheets comprises an aluminum brazing sheet having a brazing material layer on an inner surface thereof, and the flat tube comprises a bare aluminum material, each heat-conductive sheet having two portions including respective opposite ends of the flat tube and bulged outward over a length not smaller than the entire width of the flat tube, each of said opposite ends of the flat tube being positioned at a widthwise intermediate part of the corresponding bulged portion of each heat-conductive sheet, the flat tube being brazed to each heat-conductive sheet with

the brazing material layer of the aluminum brazing sheet.

20. A liquid cooling radiator according to claim 13 wherein the heat transfer member comprises a corrugated fin having crest portions and furrow portions which extend longitudinally of the cooling liquid channel of the unit main body, and connecting portions interconnecting the crest portions and the furrow portions respectively.

21. A liquid cooling radiator according to claim 20 wherein the two heat-conductive sheets and the fin are each made of aluminum, and the two heat-conductive sheets are brazed to each other, the fin having its crest portions and furrow portions brazed to the respective heat-conductive sheets.

22. A liquid cooling radiator comprising a base plate composed of two metal sheets joined as superposed on each other and provided with a heat receiving unit having a cooling liquid channel, an expansion tank device according to claim 1 and a cooling liquid circulating channel connecting the channel of the heat receiving unit to the channel of the expansion tank device, the tank installation base of the expansion tank device comprising the two metal sheets.

23. A liquid cooling radiator according to claim 22 wherein one of the two metal sheets has a through hole exposed to outside for preventing the circulating channel from short-circuiting.

24. A liquid cooling radiator according to claim 22 wherein the heat receiving unit comprises a heat receiving unit main body made from the two metal sheets and provided with a cooling liquid channel having opposite-end openings

between the two metal sheets, and a heat transfer member made from a highly heat-conductive material and provided inside the cooling liquid channel of the unit main body, the unit main body having an outer surface providing a heat receiving portion thermally in contact with a heat generating body.

25. A liquid cooling radiator according to claim 24 wherein the heat transfer member comprises a flat tube having a plurality of borelike passageways formed in parallel and extending longitudinally of the cooling liquid channel of the unit main body.

26. A liquid cooling radiator according to claim 25 wherein the two metal sheets and the flat tube are each made of aluminum, and the two metal sheets are brazed to each other, the flat tube being brazed to the two metal sheets.

27. A liquid cooling radiator according to claim 26 wherein the flat tube is brazed except at opposite end portions thereof to the two metal sheets.

28. A liquid cooling radiator according to claim 27 wherein the two metal sheets and the flat tube are each made of a bare aluminum material, and the flat tube is brazed to the two metal sheets with a sheet of brazing material.

29. A liquid cooling radiator according to claim 27 wherein one of the metal sheets comprises an aluminum brazing sheet having a brazing material layer on an inner surface thereof, and the other metal sheet and the flat tube each comprise a bare aluminum material, said one metal sheet having two portions including respective opposite ends of the flat tube and bulged outward over a length not smaller than the entire width of

the flat tube, each of said opposite ends of the flat tube being positioned at a widthwise intermediate part of the corresponding bulged portion of said one metal sheet, the flat tube being brazed to said one metal sheet with the brazing material layer of the aluminum brazing sheet, the flat tube being brazed to said other metal sheet with a sheet of brazing material.

30. A liquid cooling radiator according to claim 27 wherein each of the two metal sheets comprises an aluminum brazing sheet having a brazing material layer on an inner surface thereof, and the flat tube comprises a bare aluminum material, each metal sheet having two portions including respective opposite ends of the flat tube and bulged outward over a length not smaller than the entire width of the flat tube, each of said opposite ends of the flat tube being positioned at a widthwise intermediate part of the corresponding bulged portion of each metal sheet, the flat tube being brazed to each metal sheet with the brazing material layer of the aluminum brazing sheet.

31. A liquid cooling radiator according to claim 24 wherein the heat transfer member comprises a corrugated fin having crest portions and furrow portions which extend longitudinally of the cooling liquid channel of the unit main body, and connecting portions interconnecting the crest portions and the furrow portions respectively.

32. A liquid cooling radiator according to claim 31 wherein the two metal sheets and the fin are each made of aluminum, and the two metal sheets are brazed to each other, the fin

having its crest portions and furrow portions brazed to the respective metal sheets.

33. A notebook personal computer comprising a main body having a keyboard, and a display unit openably attached to the main body, the main body including a housing having disposed therein a liquid cooling radiator according to any one of claims 11 to 32.